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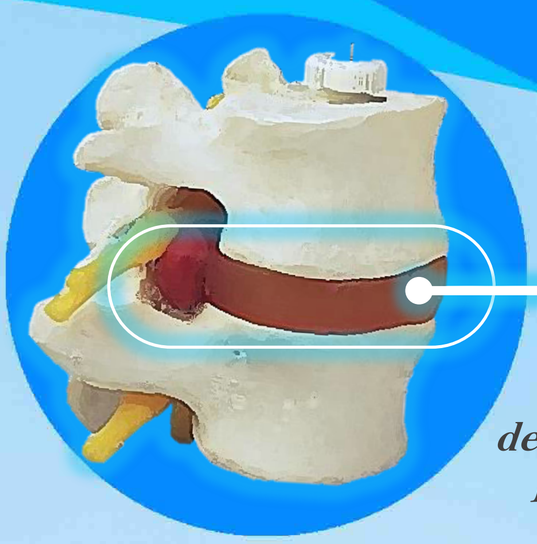
3-Dimensional Poly(Lactic-co-Glycolic Acid) (PLGA), Fibrin and Atelocollagen Bioscaffold for Intervertebral Disc (IVD) Tissue Engineering

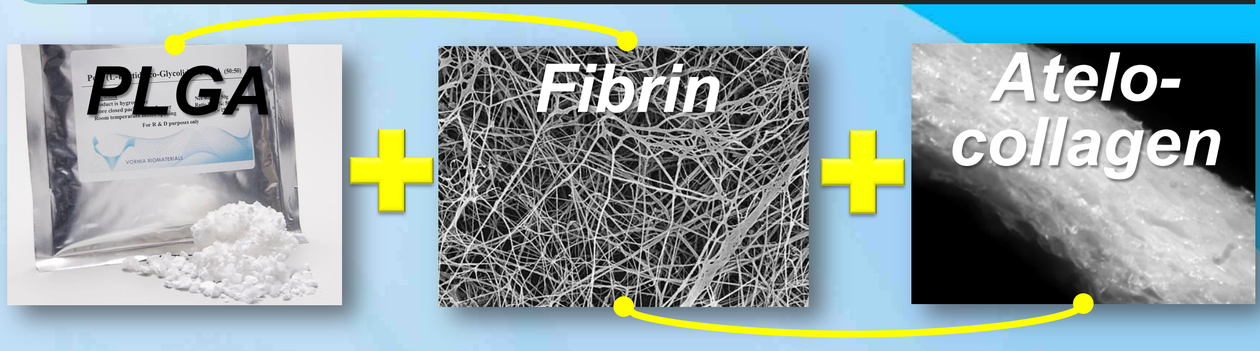


"This 3D BIOSCAFFOLD product is developed as part of Tissue Engineering and Regenerative Medicine (TERM) research initiatives…"

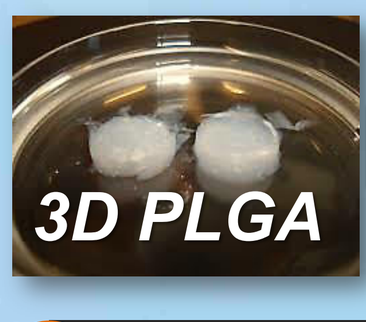
PRODUCT DESCRIPTION

- **A 3D biomaterial scaffold comprises**
  - **PLGA** → "*synthetic polymer*"
  - **Fibrin**
  - **Atelocollagen type II** } "*natural bio-polymers*"
- **Designed for IVD tissue engineering**
- **Biocompatible & safe for human use**
- **Biodegradable** → "*green biotechnology*"
- **Function:** to direct cell behaviours → *cell-matrix* & *cell-cell* interactions → facilitating sensing & responding to the microenvironment.

METHODOLOGY



"coating & modifying hydrophobic 3D PLGA surfaces with hydrophilic natural biopolymers"



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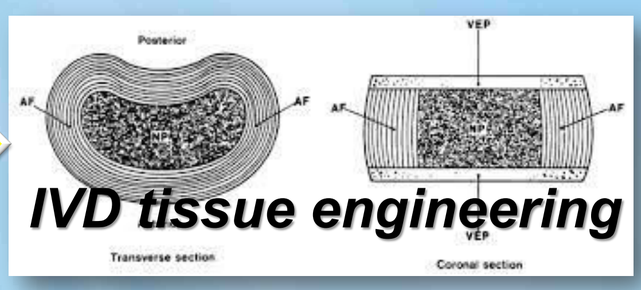
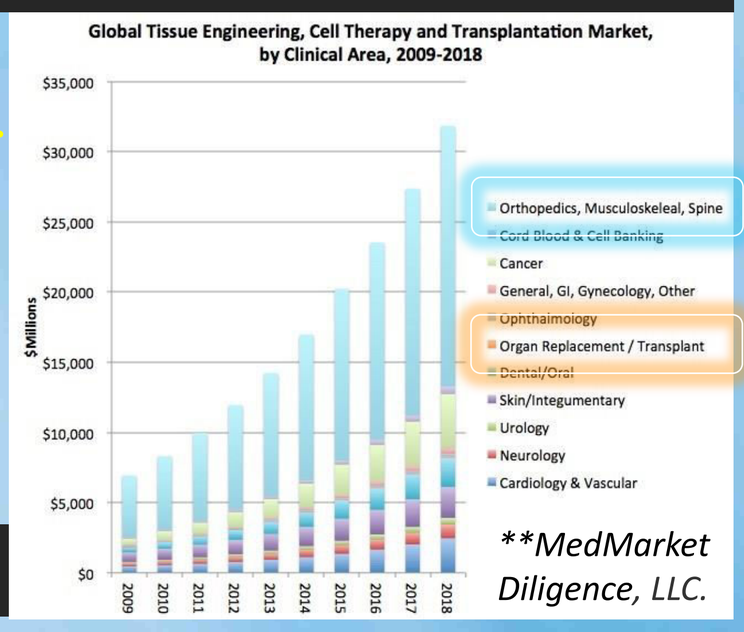


COMMERCIAL POTENTIALS

- **Market potential**
- **Market size**
- **Industrial partner**
  - **Orthopaedic**
  - **Healthcare sector**



***MedMarket Diligence, LLC.*

NOVELTIES

MEET CHARACTERISTICS OF IDEAL SCAFFOLD:

- ✓ ***Inter-connecting pores, appropriate scale favours tissue formation***
- ✓ ***Materials with controlled biodegradability or bioresorbability***
- ✓ ***Appropriate surface chemistry favours cellular attachment, proliferation & differentiation***
- ✓ ***Adequate mechanical properties in matching the site of implantation & handling***
- ✓ ***No adverse response***
- ✓ ***Easily fabricated into intended shapes & sizes***

Patent / other IPR info: ***Not applicable at the moment***

APPLICABILITY

PROBLEM SOLVING

- **Global Burden of Disease Study 2013, The Lancet (2015)*:**
  - **<u>Low back pain (LBP)</u> is one of the leading causes of health & work loss & disability.**
  - **Ageing population increases → degenerative disc disease.**
- **Current treatment options alleviate pain but not treating LBP.**
- **No known cure & lack efficient preventive strategies for LBP.**
- **TERM may offer better LBP management strategies.**
- **Engineering biomimicry tissues/organs in vitro using**
  - **CELLS, BIOMATERIALS & SIGNALS**
- **Smart BIOMATERIALS guide growth of tissues/organs.**

DUE DILIGENT

- **Global market for spine surgery devices was estimated ~$12.43 billion in 2010 and forecasted to reach ~$23.90 billion by 2020****

STATUS OF INVENTION

- **Proof of concept is currently underway: Bioscaffold has been incorporated with IVD cells & tested in an ectopic implantation model. The findings will be made available by end of 2016.**

CONCLUSION

The world population keeps growing. The proportion of elderly people increases. The number of people living in suboptimum health may rises rapidly over the coming decades. Large, preventable causes of health loss e.g. <u>serious musculoskeletal disorders</u> & mental & behavioural disorders, <u>have not received the attention they deserve</u>. Addressing these issues require <u>a shift in health priorities</u> (worldwide); not just to keep people alive into old age, but also <u>to keep them healthy</u>*. As such, this present effort should be regarded as one of the strategies in health care towards achieving this aspiration.

Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. **Vos, Theo et al. The Lancet , Volume 386 , Issue 9995 , 743 - 800*

☺ *Acknowledgement: Thank you IIUM & MOHE for FRGS 01/2013: FRGS13-016-0257*

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Noorhidayah Md Nazir… Mohd Yusof Mohammad… Ahmad Hafiz Zulkifly, Munirah Sha'ban. 2014. **Cartilaginous Properties of Nucleus Pulposus Cells Seeded on Poly(Lactic-Co-Glycolic Acid)-Based Scaffolds**. The 5th MTERMS Meeting 2014. 17th-19th September 2014, Hotel Bangi-Putrajaya, Malaysia. [ORAL]

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